IFORS' Operational Research Hall of Fame
John D. C. Little

Fundamental contributor to queueing theory, traffic flow management, branch and bound optimization, decision support systems, and marketing science – a field that he helped to create.

Born: February 1, 1928, Boston, Massachusetts, USA.

Education: S.B. Physics, Massachusetts Institute of Technology (M.I.T.) (1948); Ph.D., Physics and Operations Research, M.I.T. (1955).

Currently: Institute Professor, Professor of Management Science, M.I.T. (1989–).

Key positions: Operations Analyst, U.S. Army, Ft. Monroe, Virginia (1955–56); Assistant Professor of Operations Research, Case Western Reserve University, Cleveland, Ohio (1957–60); Associate Professor of Operations Research, Case Western Reserve University (1960–62); Associate Professor of Operations Research and Management, Sloan School, M.I.T. (1962–67); Professor of Operations Research and Management, Sloan School, M.I.T. (1967–78); George Maverick Bunker Professor of Management Science, Sloan School, M.I.T. (1978–89).

Awards: National Academy of Engineering, (1989); Charles Coolidge Parlin Award of the American Marketing Association (1979); George E. Kimball Medal of the Operations Research Society of America (ORSA)(1987); First Philip McCord Morse Lecturer of ORSA, (1989–90); Honorary Degree, University of Liege, Belgium, (1992); Honorary De-

gree, Facultés Universitaires Catholiques de Mons, Belgium, (1997); Distinguished Paper Award DSS Competition (with J.D. Schmitz and G.D. Armstrong) for "CoverStory – Automated News Finding in Marketing" (1990); Omega Rho Distinguished Lecturer, INFORMS San Antonio Meeting, (2000); INFORMS Expository Writing Award, (2000); Paul D. Converse Award of the American Marketing Association for "major contributions to the science of marketing," (1992).

Fellow: INFORMS; American Association for the Advancement of Science.

Key OR roles: President, ORSA (1979–80); President, TIMS (1984–5); Founding President of INFORMS (1995).

John D. C. Little was the first American Ph.D. in Operations Research. In fact, his Ph.D. is in "Physics and Operations Research," on how to manage flow of water in a reservoir/dam system. His research advisor was the acclaimed MIT physicist and founder of OR in the USA, Philip M. Morse. Little remembers being in Morse's crammed office with its 2.5 by 3 foot blackboard and shabby sofa, but with stimulating focused conversations with Morse. Like Morse, John Little has employed throughout his life in OR the paradigm of the physicist who is both an experimentalist and a theoretician. He was guided by the definition of OR popularized by Morse and Kimball in their 1951 *Methods of Operations Research* "Operations Research is a scientific method of providing executive departments with a quantitative basis for decisions regarding operations under their control." In his review of Morse in the 50th Anniversary issue of *Operations Research*, Little says, "The definition leaves room for tremendous development of methodology that we have witnessed in the past 50 years, but it keeps our feet on the ground with the requirement for *data, models, and decisions*. I like that, and I am sure it is what Morse intended." (emphasis added)

In his OR work, John would go first to the 'real world' to undertake observations and data collection and then return to his office where, often with students, he would attempt to model the observed phenomena, iterating between the observed and modeled worlds until he got it right. This marked his professional behavior in such disparate subfields of OR as traffic signal synchronization, queues, the process of managing, and marketing.

Little's earliest substantial contribution to OR was a first proof of the now-famous queueing formula, $L = \lambda W$. Assuming steady state operation, this says that the time-average number of customers in the system is equal to the average arrival rate of customers accepted into the system multiplied by the average time that each spends in the system. That formula, coupled with its cousin, $L_q = \lambda W_q$, allows one to obtain four fundamental performance measures of a queue by calculating only one of them from basic modeling methods. Apparently Little was motivated to investigate the general truth of this relationship by Morse, who noted while writing the first text on queueing theory, *Queues, Inventory and Maintenance* (Wiley, 1958), that this curious formula always seemed to apply for each of the queues whose operational behavior Morse solved the long, hard way. In virtually every OR textbook and major journal article on queues, it is now cited as "Little's Law". "$L = \lambda W$" has become the "$F = ma$" of operations research and has entered OR folklore. At an OR national conference in New Orleans many years ago, various OR T-shirts were being sold to raise money for ORSA. A best seller was the one that proclaimed: *It may be Little, but It's the Law*.

Little started his OR academic career at Case Western Reserve University (1957–62). Work done at Case Western produced a co-authored paper on the traveling salesman problem, a paper that popularized and named 'branch and bound' in mathematical programming. In mid 1962, he accepted a faculty position at MIT in "Course 15," now known as the Sloan School of Management. He has been at MIT ever since.

One of his first areas of focus while at MIT was use of mathematical programming to synchronize fixed-timed traffic lights for streets with two-way traffic. He and his research colleagues defined the new state of the art in this field, ending with a set of algorithms called MAXBAND. During this period he was the first to apply probabilistic adaptive control to field advertising experiments.

A landmark paper for Little was "Managers and Models: The Concept of a Decision Calculus" (1970), whose concepts have been adopted and used world-wide. This paper was instrumental in

maintaining a focus on the practical use of OR models by real managers making real decisions. This led to his 'next career' in operations research, which moved first to management decision support systems and then culminated in the birth of 'marketing science.' An early classic sequence of papers in this new area was "BRANDAID: A Marketing–Mix Model, Part 1: Structure" and "Part 2: Implementation, Calibration, and Case Study": *Operations Research*, Vol. 23, 628–673 (July 1975). Later a sequence of important papers applying logit models to marketing appeared. Little was perhaps the first serious researcher to understand and then show how to exploit the marketing-relevant information in supermarket scanning data. These papers were instrumental in changing the focus of investigation of consumer purchasing behavior from an aggregate to a disaggregate perspective. More recently, he has been one of the first researchers to investigate data analysis related to Internet purchases.

Professor Little has successfully applied his ideas in the private sector. He co-founded a marketing models firm, Management Decision Systems, which in 1985 was acquired by Information Resources, Inc. At the time of the merger, MDS had 210 employees and offices in Boston, New York, Chicago, San Francisco, Toronto, Los Angeles, London, Paris, and Sydney. The principal products were EXPRESS decision support software for financial and marketing applications, and many software packages that have been used throughout the marketing field, such as ASSESSOR, BRANDAID, PERCEPTOR, and PROMOTER. In 1997 he was co-founder and director of an Internet company, InSite Marketing Technology, Inc., of Waltham, Massachusetts.

At MIT he has assumed a variety of leadership positions: Director, Operations Research Center (1969–75); Head, Management Science Area, Sloan School (1972–82); Head, Behavioral and Policy Sciences Area, Sloan School (1982–88). John has been a steward of Sloan's undergraduate program in Management Science – a program that is consistently ranked in the top-two or three programs in the world. He has also been an inspirational leader in OR national societies, serving as president in all three: ORSA (1979–80); TIMS, (1984–5); and INFORMS (1995), as Founding President. He was instrumental in designing the merger of ORSA and TIMS to create INFORMS. In honor of his seminal work in marketing science, each year the INFORMS Society of Marketing Science presents the "John D.C. Little Award" to the best marketing paper published in *Marketing Science* or *Management Science*.

In 1989 Little was named MIT Institute Professor, a title that MIT reserves for about 12 scholars of special distinction. The honor is initiated by the faculty and bestowed jointly by the administration and faculty. According to former Chair of the MIT Faculty, Professor Robert Jaffe, Institute Professors "… are all world leaders in their fields. They are absolutely extraordinary in terms of being role models, in the creativity and depth of their scholarship and teaching and in their commitment to the Institute and to academia in general."

John lives in Lincoln, Massachusetts where he and his late wife raised four children. For over thirty years John has hosted Thanksgiving dinners for non-US graduate students. To this day, many cite this experience as a highlight of their time at MIT.

John D. C. Little is an exemplary OR teacher, researcher, practitioner and leader. As an OR teacher, he helped transform the embryonic OR program at MIT to one of the world's premier sources of OR academic and research contributions. As an OR researcher, he is recognized as a founder of the field of marketing science. He has made fundamental contributions in queueing, transportation science, mathematical optimization, decision support systems and marketing

science. As an OR practitioner, he pioneered the use of decision support systems for financial and marketing applications. As an OR leader, he has served as president of ORSA and TIMS, led the effort for their merger into INFORMS, and served as INFORMS' first president. He exemplifies the rare multi-faceted OR professional. His induction into the OR Hall of Fame is most deserved.

Richard C. Larson

Selected original works

Little, J.D.C., 1961. A Proof for the Queuing Formula: $L = \lambda W$. *Operations Research*, 9, 383–7.

Little, J.D.C., Murty, K.G., Sweeney, D.W., Karel, C., 1963. An Algorithm for the Traveling Salesman Problem. *Operations Research*, 11, 972–89.

Little, J.D.C., 1966. The Synchronization of Traffic Signals by Mixed-Integer Linear Programming. *Operations Research*, 14, 568–94.

Little, J.D.C., 1966. A Model of Adaptive Control of Promotional Spending. *Operations Research*, 14, 1075–98.

Little, J.D.C., Lodish, L., 1969. A Media Planning Calculus. *Operations Research*, 17, 1–35.

Little, J.D.C., 1970. Managers and Models: The Concept of a Decision Calculus. *Management Science*, 16, B466–85.

Little, J.D.C., 1979. Decision Support Systems for Marketing Managers. *Journal of Marketing*, 43(3), 9–26.

Little, J.D.C., Cohen, S., 1982. The MAXBAND Program for Arterial Signal Timing Plans. *Public Roads*, 46(2), 61–5.

Guadagni, P.M., Little, L.D.C., 1983. A Logit Model of Brand Choice Calibrated on Scanner Data. *Marketing Science*, 2, 203–238.

Little, J.D.C., 1998. Integrated Measures of Sales, Merchandising, and Distribution. *International Journal of Research in Marketing*, 15, 473–85.

Little, J.D.C., 2002. Philip M. Morse and the Beginnings. *Operations Research*, 50, 146–8.